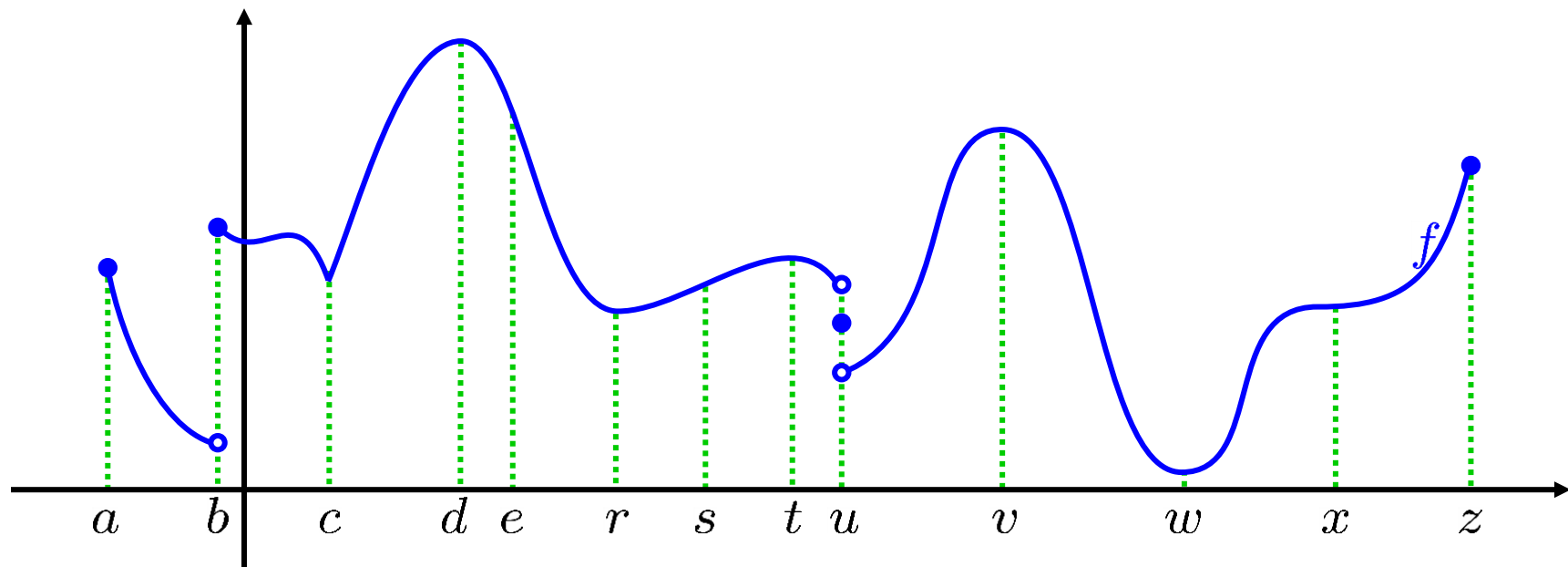


CALCULUS
Maxima and minima
NEW

0450-1. a. **Sketch** the graph of a continuous function whose domain is $[1, \infty)$, and which has **exactly two** global maxima, and **exactly one** local minimum.

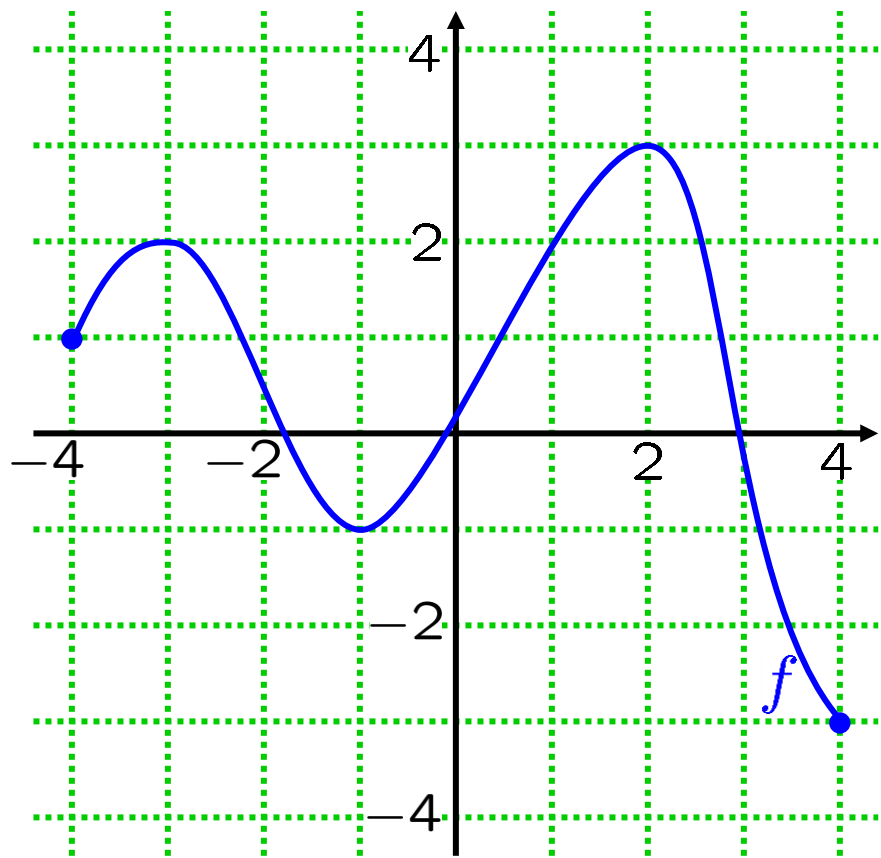
b. **Sketch** the graph of a continuous function whose domain is $[2, 4)$, and which has **exactly two** global minima, and **no** global maxima.

0450-2. Let $f : [a, z] \rightarrow \mathbb{R}$ be the function whose graph is shown below.



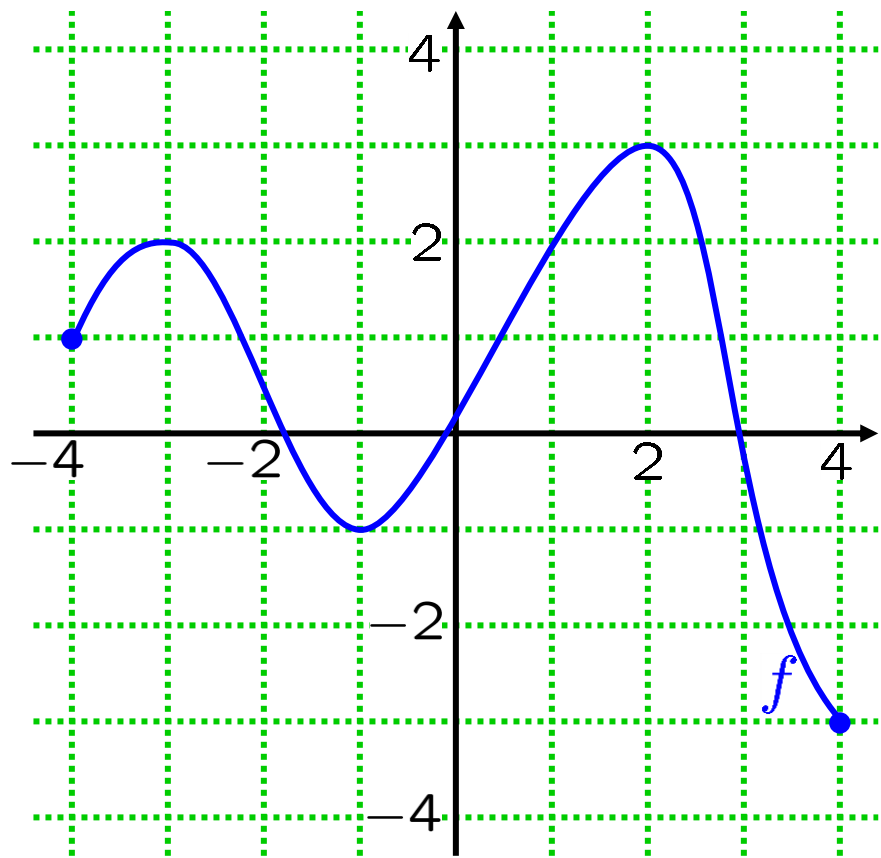
- i. For each number $a, b, c, d, e, r, s, t, u, v, w, x, z$, state whether or not f has, at that number,
- a global maximum
 - a global minimum
 - a local maximum
 - a local minimum.
- ii. Which of $a, b, c, d, e, r, s, t, u, v, w, x, z$, is a critical number for f ?

NEW 0450-3. Let $f : [-4, 4] \rightarrow \mathbb{R}$ be the function whose graph is displayed below.



- At **what** numbers x does $f(x)$ have a local minimum?
- What** are the corresponding local minimum values?
- At **what** numbers x does $f(x)$ have a local maximum?
- What** are the corresponding local maximum values?

0450-4. NEW Let $f : [-4, 4] \rightarrow \mathbb{R}$ be the function whose graph is displayed below.



a. At **what** numbers x does $f(x)$ have a global minimum?

b. **What** is the corresponding global minimum value?

c. At **what** numbers x does $f(x)$ have a global maximum?

d. **What** is the corresponding global maximum value?

0450-5.
NEW

Sketch a graph of a function whose domain is $[-3, 2]$ and which has
no global minima,
one local minimum,
and two global maxima.

Note: By the Extreme Value Theorem,
it **cannot** be continuous on $[-3, 2]$.

0450-6.
NEW

Sketch a graph of a function whose domain is $[1, 4]$, which is continuous on $[1, 4]$ and which has
three global maxima,
one local maximum
and two global minima.

NEW 0450-7. Define $f : [-2, 2] \rightarrow \mathbb{R}$ by $f(x) = -x^6$.

- a. Sketch the graph of f .
- b. Does f have a global maximum?
If so, at what number(s)?
- c. Does f have a global minimum?
If so, at what number(s)?
- d. Does f have a local maximum?
If so, at what number(s)?
- e. Does f have a local minimum?
If so, at what number(s)?
- f. What are the critical numbers of f ?

NEW 0450-8. Define $f : (-2, 2) \rightarrow \mathbb{R}$ by $f(x) = -x^6$.

- a. Sketch the graph of f .
- b. Does f have a global maximum?
If so, at what number(s)?
- c. Does f have a global minimum?
If so, at what number(s)?
- d. Does f have a local maximum?
If so, at what number(s)?
- e. Does f have a local minimum?
If so, at what number(s)?
- f. What are the critical numbers of f ?

NEW 0450-9. Define $f : [-2, 2] \rightarrow \mathbb{R}$ by $f(x) = -3x^5$.

- a. Sketch the graph of f .
- b. Does f have a global maximum?
If so, at what number(s)?
- c. Does f have a global minimum?
If so, at what number(s)?
- d. Does f have a local maximum?
If so, at what number(s)?
- e. Does f have a local minimum?
If so, at what number(s)?
- f. What are the critical numbers of f ?

0450-10. Define $f : (-2, 2) \rightarrow \mathbb{R}$ by $f(x) = -3x^5$.
NEW

- a. Sketch the graph of f .
- b. Does f have a global maximum?
If so, at what number(s)?
- c. Does f have a global minimum?
If so, at what number(s)?
- d. Does f have a local maximum?
If so, at what number(s)?
- e. Does f have a local minimum?
If so, at what number(s)?
- f. What are the critical numbers of f ?

0450-11. Define $f : (-2, 2) \rightarrow \mathbb{R}$ by
NEW $f(x) = x^3 - x.$

- a. Sketch the graph of f .
- b. Does f have a global maximum?
If so, at what number(s)?
- c. Does f have a global minimum?
If so, at what number(s)?
- d. Does f have a local maximum?
If so, at what number(s)?
- e. Does f have a local minimum?
If so, at what number(s)?
- f. What are the critical numbers of f ?

0450-12. Define $f : [-2, 2] \rightarrow \mathbb{R}$ by
 $f(x) = x^3 - x$.

- a. Sketch the graph of f .
- b. Does f have a global maximum?
If so, at what number(s)?
- c. Does f have a global minimum?
If so, at what number(s)?
- d. Does f have a local maximum?
If so, at what number(s)?
- e. Does f have a local minimum?
If so, at what number(s)?
- f. What are the critical numbers of f ?

0450-13. Find the critical numbers of
 $f(x) = x^3 + 4x^2 - 3x + \sqrt{7}$.

0450-14. Find the critical numbers of
 $f(x) = |x^2 - 4x + 3|$.

0450-15. Find the critical numbers of
 $f(x) = |4x^2 - 4x + 1|$.

0450-16. Find the critical numbers of
 $f(x) = \sin(4x)$.

0450-17. Find the critical numbers of
 $f(x) = |\sin(4x)|$.

0450-18. Find the global maximum and minimum values of

$$f(x) = 3x^3 - x + \pi$$

on $0 \leq x \leq 1$.

0450-19. Find the global maximum and minimum values of

$$g(t) = \frac{2t}{t^2 + 4}$$

on $-3 \leq t \leq 0$.

0450-20. Find the global maximum and minimum values of

$$H(s) = se^{-s^2/2}$$

on $0 \leq s \leq 3$.